Detecting Forest Fires by Using Remotely Sensed Data in Riau, Indonesia

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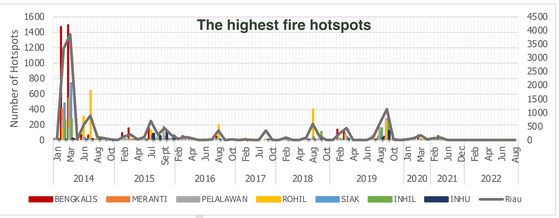
Introduction

Forest fires cause extreme long-term damage to the environment, flora, fauna, and property including forestry and agricultural holdings every year [1],[2].

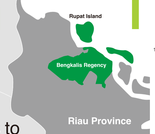
Forest fires is considered as one of serious disasters [4], and its frequency in tropical countries, especially **Rupat-Bengkalis Island, Riau Province, Indonesia**. The province has experienced growing pressure from an expanding **palm oil industry and industrial timber plantation**.



In the **mega-fires** of 2014, 2015, and **2019**, about 1.17 million hectares of forest and land were burned each year.

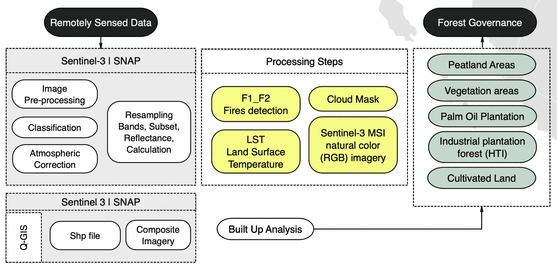
This research aims to shed light on how **remote sensing data** can help in detecting forest fires in tropical climate. In this situation, the use of **Sentinel data** makes it possible to make assessments related to land and forest fires for proper forestry governance.

Data & Study Area



Since 2013, **Rupat Island - Bengkalis Regency**,**Riau Province Sumatra Island**, Indonesia is the most vulnerable region for forest fires.

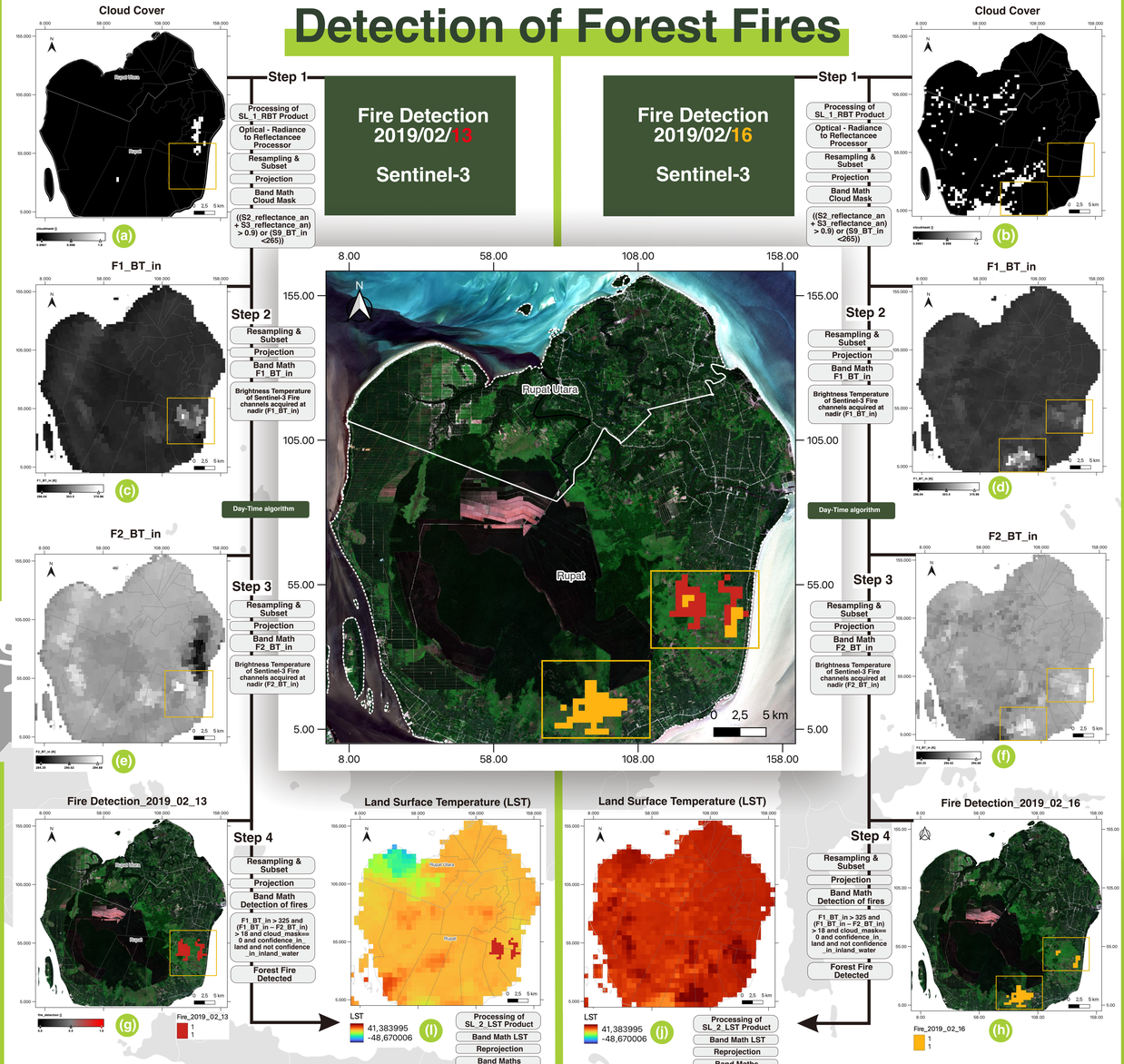
The research utilizes remote sensing data as references to achieve its objectives, for instance, land and forest fires using **Radiances and Brightness Temperature (RBT).**



Sentinel-3 SL_1_RBT data was accessed through **https://scihub.copernicus.eu/** then visualized through SNAP tools and Q-GIS software.

Remote sensing analysis revealed by the formulas **F1_BT_in**, **F2_BT_in**, **cloud mask** [3], and **land surface temperature (LST)**, demonstrated better combined values for forest fire detection accuracy.

Detection of Forest Fires



Note: Multi-source data from remote sensing extraction of the burned areas or fires spot using **Sentinel-3 data**, hotspots found on **2019 February 13**, and **2019 February 16**, respectively

Scan QR codes

Analysis & Results

Finding of this work, together with the forest fires detection showed that there were extensive land fires in several different areas.

Cloud Mask (a) (b)

The images show a **cloud mask calculated**, which is marked with **darker values** when there is no cloud.

Processing F1-BT_in

The **active fires were detected** in warm bright areas where the burned areas are warm but already burned, so the temperature would generally be lower than at the edges where the fire is still active **(F1_BT_in).** (c) (d)

Processing F2-BT_in

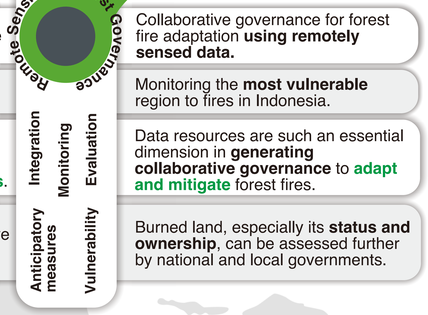
The brightness temperature is higher in the centre and the pixels are eliminated by the condition that is set up for the removal of the warm background **(F2_BT_in).** (e) (f)

Land Surface Temperature

We found that the **LST was increased** by fires event compared with the surrounding area, respectively. As detected point data for all fire events, each fire is associated with the value of LST in the same location of the fire event. (i) (j)

Detection of Forest Fires

Detection of **forest fires** that are clearly visible by running **a data algorithm** to ensure that the fire point is not covered by cloud. (g) (h)



Remote sensing visualises the fire events, the megafires of 2019, where the forest and the land burned.

Collaborative governance for forest fire adaptation **using remotely sensed data.**

Mapping the **most vulnerable** region to fires in Indonesia.

Monitoring the **most vulnerable** region to fires in Indonesia.

The forest fires sensed in Rupat occurred between **oil palm plantations** and **industrial forest production (HTI)**, both in **peatlands**.

Data resources are such an essential dimension in **generating collaborative governance** to **adapt and mitigate** forest fires.

This automated mapping not only detects fires but also areas that have been burned (**most likely for new plantation areas**).

Burned land, especially its **status and ownership**, can be assessed further by national and local governments.

Conclusions

The study concludes that **remotely sensed data provides** updated information of intensities of forest fires with **Sentinel-3** analysis showed the importance of environmental condition, where the variable and approach should be **developed for monitoring framework on forest fires**.

Hence, detecting fires requires an accurate and suitable approach for monitoring burned land to strengthening planning strategies by **remotely sensed data.**

The **effectiveness of this methodology** provides an alternative approach for **forest governance**.

The approach is also **efficient for government institution** to create an operational **monitoring in forest governance**. Further, the technique can also be relied upon for **mapping vulnerable forest fires** useful for developing mitigation plans whose objectives are to decrease forest and peatland losses.

References

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